

Please type a plus sign (+) inside this box → ☐

PTO/SB/05 (2/98)
Approved for use through 09/30/00. OMB 0651-0032
Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

UTILITY PATENT APPLICATION TRANSMITTAL <small>(Only for new nonprovisional applications under 37 CFR 1.53(b))</small>		Attorney Docket No. 042390.P5980	
First Inventor or Application Identifier Amir S. Afshary		Title DIGITAL COAXIAL CABLE LAN	
Express Mail Label No. EM522830405US		PTO 09/30/98	

APPLICATION ELEMENTS <small>See MPEP chapter 600 concerning utility patent application contents</small> 1. <input checked="" type="checkbox"/> Fee Transmittal Form <small>(Submit an original, and a duplicate for fee processing)</small> 2. <input checked="" type="checkbox"/> Specification [Total Pages 23] <small>(preferred arrangement set forth below)</small> <ul style="list-style-type: none">- Descriptive title of the invention- Cross References to Related Applications- Statement Regarding Fed sponsored R & D- Reference to Microfiche Appendix- Background of the invention- Brief Summary of the invention- Brief Description of the Drawings (if filed)- Detailed Description- Claim(s)- Abstract of the Disclosure 3. <input checked="" type="checkbox"/> Drawing(s) (35 CFR 113) [Total Sheets 3] 4. Oath or Declaration [Total Pages 3] <ul style="list-style-type: none">a. <input checked="" type="checkbox"/> Newly executed (original copy)b. <input type="checkbox"/> Copy from a prior application (37 CFR 1.63(d)) <small>(for continuation/divisional with Box 17 completed)</small> [Note Box 5 below]<ul style="list-style-type: none">i. <input type="checkbox"/> DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b). 5. <input type="checkbox"/> Incorporation By Reference (usable if Box 4b is checked) The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.	6. <input type="checkbox"/> Microfiche Computer Program (Appendix) 7. Nucleotide and/or Amino Acid Sequence Submission (if applicable, all necessary) <ul style="list-style-type: none">a. <input type="checkbox"/> Computer Readable Copyb. <input type="checkbox"/> Paper Copy (identical to computer copy)c. <input type="checkbox"/> Statement verifying identity of above copies
--	--

ACCOMPANYING APPLICATION PARTS	
8. <input checked="" type="checkbox"/> Assignment Papers (cover sheet & document(s)) 9. <input type="checkbox"/> 37 CFR 3.73(b) Statement <input type="checkbox"/> Power of Attorney <small>(when there is an assignee)</small> 10. <input type="checkbox"/> English Translation Document (if applicable) 11. <input checked="" type="checkbox"/> Information Disclosure Statement (IDS)/PTO - 1449 <input checked="" type="checkbox"/> Copies of IDS Citations 12. <input type="checkbox"/> Preliminary Amendment 13. <input checked="" type="checkbox"/> Return Receipt Postcard (MPEP 503) <small>(Should be specifically itemized)</small> 14. <input type="checkbox"/> *Small Entity <input type="checkbox"/> Statement filed in prior application, Status still proper and desired 15. <input type="checkbox"/> Certified Copy of Priority Document(s) <small>(if foreign priority is claimed)</small> 16. <input type="checkbox"/> Other:	

17. If a CONTINUING APPLICATION, check appropriate box and supply the requisite information: <input type="checkbox"/> Continuation <input type="checkbox"/> Divisional <input type="checkbox"/> Continuation-in-part (CIP) of prior application No: _____/ Prior application Information: Examiner _____ Group/Art Unit: _____					
18. CORRESPONDENCE ADDRESS					
<input type="checkbox"/> Customer Number of Bar Code Label (Insert Customer No. or Attach bare code label here) or <input checked="" type="checkbox"/> Correspondence address below					
Name	BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP				
Address	12400 Wilshire Boulevard, Seventh Floor				
City	Los Angeles	State	California	Zip Code	90025
Country	U.S.A.	Telephone	(310) 207-3800	Fax	(310) 820-5988

Name (Print/Type) Vincent P. Tassinari, Reg. No. 42,179	
Signature	Date 9/30/98

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231.

09/30/98
U.S. PTO

09164437 093098

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

FEE TRANSMITTAL <small>Petent fees are subject to annual revision on October 1. These are the fees effective October 1, 1997. Small Entity payments must be supported by a small entity statement, otherwise large entity fees must be paid. See Forms PTO/SB/09-12. See 37 C.F.R. §§ 1.28 and 1.28</small>		Complete if Known	
TOTAL AMOUNT OF PAYMENT (\$) 922.00		Application Number	
		Filing Date	09/30/98
		First Named Inventor	Amir S. Afshary, et al.
		Examiner Name	
		Group Art Unit	
		Attorney Docket Number	042390.P5980

METHOD OF PAYMENT (check one)		FEE CALCULATION (continued)																																																																																																																																																																																					
<p>1. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge indicated fees and credit any over payments to:</p> <p>Deposit Account Number: 02-2666</p> <p>Deposit Account Name: Blakely, Sokoloff, Taylor & Zafman LLP</p> <p><input checked="" type="checkbox"/> Charge Any Additional Fee Required Under 37 CFR 1.16 and 1.17 <input type="checkbox"/> Charge the Issue Fee Set in 37 CFR 1.18 at the Mailing of the Notice of Allowance.</p> <p>2. <input checked="" type="checkbox"/> Payment Enclosed: <input checked="" type="checkbox"/> Check <input type="checkbox"/> Money Order <input type="checkbox"/> Other</p>		<p>3. ADDITIONAL FEE</p> <table border="1"><thead><tr><th>Large Fee Code</th><th>Entity Fee (\$)</th><th>Small Fee Code</th><th>Entity Fee (\$)</th><th>Fee Description</th><th>Fee Paid</th></tr></thead><tbody><tr><td>105</td><td>130</td><td>205</td><td>65</td><td>Surcharge - late filing fee or oath</td><td></td></tr><tr><td>127</td><td>50</td><td>227</td><td>25</td><td>Surcharge - late provisional filing fee or cover sheet.</td><td></td></tr><tr><td>139</td><td>130</td><td>139</td><td>130</td><td>Non-English specification</td><td></td></tr><tr><td>147</td><td>2,520</td><td>147</td><td>2,520</td><td>For filing a request for reexamination</td><td></td></tr><tr><td>112</td><td>920</td><td>112</td><td>920</td><td>Requesting publication of SIR prior to Examiner action</td><td></td></tr><tr><td>113</td><td>1,840</td><td>113</td><td>1,840</td><td>Requesting publication of SIR after Examiner action</td><td></td></tr><tr><td>115</td><td>110</td><td>215</td><td>55</td><td>Extension for response within first month</td><td></td></tr><tr><td>116</td><td>400</td><td>216</td><td>200</td><td>Extension for response within second month</td><td></td></tr><tr><td>117</td><td>950</td><td>217</td><td>475</td><td>Extension for response within third month</td><td></td></tr><tr><td>118</td><td>1,510</td><td>218</td><td>755</td><td>Extension for response within fourth month</td><td></td></tr><tr><td><input checked="" type="checkbox"/> 128</td><td>2,060</td><td>228</td><td>1,030</td><td>Extension for response within fifth month</td><td></td></tr><tr><td>119</td><td>310</td><td>219</td><td>155</td><td>Notice of Appeal</td><td></td></tr><tr><td>120</td><td>310</td><td>220</td><td>155</td><td>Filing a brief in support of an appeal</td><td></td></tr><tr><td>121</td><td>270</td><td>221</td><td>135</td><td>Request for oral hearing</td><td></td></tr><tr><td>138</td><td>1,510</td><td>138</td><td>1,510</td><td>Petition to institute a public use proceeding</td><td></td></tr><tr><td>140</td><td>110</td><td>240</td><td>55</td><td>Petition to revive - unavoidably</td><td></td></tr><tr><td>141</td><td>1,320</td><td>241</td><td>660</td><td>Petition to revive - unintentionally</td><td></td></tr><tr><td>142</td><td>1,320</td><td>242</td><td>660</td><td>Utility issue fee (or reissue)</td><td></td></tr><tr><td>143</td><td>450</td><td>243</td><td>225</td><td>Design issue fee</td><td></td></tr><tr><td>144</td><td>670</td><td>244</td><td>335</td><td>Plant issue fee</td><td></td></tr><tr><td>122</td><td>130</td><td>122</td><td>130</td><td>Petitions to the Commissioner</td><td></td></tr><tr><td>123</td><td>50</td><td>123</td><td>50</td><td>Petitions related to provisional applications</td><td></td></tr><tr><td>126</td><td>240</td><td>126</td><td>240</td><td>Submission of Information Disclosure Stmt</td><td></td></tr><tr><td>581</td><td>40</td><td>581</td><td>40</td><td>Recording each patent assignment per property (times number of properties)</td><td></td></tr><tr><td>146</td><td>790</td><td>246</td><td>395</td><td>Filing a submission after final rejection (37 CFR 1.129(a))</td><td></td></tr><tr><td>149</td><td>790</td><td>249</td><td>395</td><td>For each additional invention to be examined (37 CFR 1.129(b))</td><td></td></tr><tr><td colspan="5">Other fee (specify) _____</td><td></td></tr><tr><td colspan="5">Other fee (specify) _____</td><td></td></tr><tr><td colspan="5">SUBTOTAL (3) (\$)</td><td></td></tr></tbody></table>		Large Fee Code	Entity Fee (\$)	Small Fee Code	Entity Fee (\$)	Fee Description	Fee Paid	105	130	205	65	Surcharge - late filing fee or oath		127	50	227	25	Surcharge - late provisional filing fee or cover sheet.		139	130	139	130	Non-English specification		147	2,520	147	2,520	For filing a request for reexamination		112	920	112	920	Requesting publication of SIR prior to Examiner action		113	1,840	113	1,840	Requesting publication of SIR after Examiner action		115	110	215	55	Extension for response within first month		116	400	216	200	Extension for response within second month		117	950	217	475	Extension for response within third month		118	1,510	218	755	Extension for response within fourth month		<input checked="" type="checkbox"/> 128	2,060	228	1,030	Extension for response within fifth month		119	310	219	155	Notice of Appeal		120	310	220	155	Filing a brief in support of an appeal		121	270	221	135	Request for oral hearing		138	1,510	138	1,510	Petition to institute a public use proceeding		140	110	240	55	Petition to revive - unavoidably		141	1,320	241	660	Petition to revive - unintentionally		142	1,320	242	660	Utility issue fee (or reissue)		143	450	243	225	Design issue fee		144	670	244	335	Plant issue fee		122	130	122	130	Petitions to the Commissioner		123	50	123	50	Petitions related to provisional applications		126	240	126	240	Submission of Information Disclosure Stmt		581	40	581	40	Recording each patent assignment per property (times number of properties)		146	790	246	395	Filing a submission after final rejection (37 CFR 1.129(a))		149	790	249	395	For each additional invention to be examined (37 CFR 1.129(b))		Other fee (specify) _____						Other fee (specify) _____						SUBTOTAL (3) (\$)					
Large Fee Code	Entity Fee (\$)	Small Fee Code	Entity Fee (\$)	Fee Description	Fee Paid																																																																																																																																																																																		
105	130	205	65	Surcharge - late filing fee or oath																																																																																																																																																																																			
127	50	227	25	Surcharge - late provisional filing fee or cover sheet.																																																																																																																																																																																			
139	130	139	130	Non-English specification																																																																																																																																																																																			
147	2,520	147	2,520	For filing a request for reexamination																																																																																																																																																																																			
112	920	112	920	Requesting publication of SIR prior to Examiner action																																																																																																																																																																																			
113	1,840	113	1,840	Requesting publication of SIR after Examiner action																																																																																																																																																																																			
115	110	215	55	Extension for response within first month																																																																																																																																																																																			
116	400	216	200	Extension for response within second month																																																																																																																																																																																			
117	950	217	475	Extension for response within third month																																																																																																																																																																																			
118	1,510	218	755	Extension for response within fourth month																																																																																																																																																																																			
<input checked="" type="checkbox"/> 128	2,060	228	1,030	Extension for response within fifth month																																																																																																																																																																																			
119	310	219	155	Notice of Appeal																																																																																																																																																																																			
120	310	220	155	Filing a brief in support of an appeal																																																																																																																																																																																			
121	270	221	135	Request for oral hearing																																																																																																																																																																																			
138	1,510	138	1,510	Petition to institute a public use proceeding																																																																																																																																																																																			
140	110	240	55	Petition to revive - unavoidably																																																																																																																																																																																			
141	1,320	241	660	Petition to revive - unintentionally																																																																																																																																																																																			
142	1,320	242	660	Utility issue fee (or reissue)																																																																																																																																																																																			
143	450	243	225	Design issue fee																																																																																																																																																																																			
144	670	244	335	Plant issue fee																																																																																																																																																																																			
122	130	122	130	Petitions to the Commissioner																																																																																																																																																																																			
123	50	123	50	Petitions related to provisional applications																																																																																																																																																																																			
126	240	126	240	Submission of Information Disclosure Stmt																																																																																																																																																																																			
581	40	581	40	Recording each patent assignment per property (times number of properties)																																																																																																																																																																																			
146	790	246	395	Filing a submission after final rejection (37 CFR 1.129(a))																																																																																																																																																																																			
149	790	249	395	For each additional invention to be examined (37 CFR 1.129(b))																																																																																																																																																																																			
Other fee (specify) _____																																																																																																																																																																																							
Other fee (specify) _____																																																																																																																																																																																							
SUBTOTAL (3) (\$)																																																																																																																																																																																							
<p>1. FILING FEE</p> <table border="1"><thead><tr><th>Large Fee Code</th><th>Entity Fee (\$)</th><th>Small Fee Code</th><th>Entity Fee (\$)</th><th>Fee Description</th><th>Fee Paid</th></tr></thead><tbody><tr><td>101</td><td>790</td><td>201</td><td>395</td><td>Utility filing fee</td><td>\$790</td></tr><tr><td>106</td><td>330</td><td>206</td><td>165</td><td>Design filing fee</td><td></td></tr><tr><td>107</td><td>540</td><td>207</td><td>270</td><td>Plant filing fee</td><td></td></tr><tr><td>108</td><td>790</td><td>208</td><td>395</td><td>Reissue filing fee</td><td></td></tr><tr><td>114</td><td>150</td><td>214</td><td>75</td><td>Provisional filing fee</td><td></td></tr><tr><td colspan="5">SUBTOTAL (1) (\$)</td><td>790.00</td></tr></tbody></table> <p>2. EXTRA CLAIM FEES</p> <table border="1"><thead><tr><th>Total Claims</th><th>Extra Claims</th><th>Fee from below</th><th>Fee Paid</th></tr></thead><tbody><tr><td>26</td><td>-20** = 6</td><td>X \$22.00 =</td><td>132.00</td></tr><tr><td>3</td><td>-3** = 0</td><td>X \$82.00 =</td><td>0.00</td></tr><tr><td colspan="4">Multiple Dependent</td></tr></tbody></table> <p>**or number of previously paid, if greater; For Reissues, see below</p> <table border="1"><thead><tr><th>Large Fee Code</th><th>Entity Fee (\$)</th><th>Small Fee Code</th><th>Entity Fee (\$)</th><th>Fee Description</th></tr></thead><tbody><tr><td>103</td><td>22</td><td>203</td><td>11</td><td>Claims in excess of 20</td></tr><tr><td>102</td><td>82</td><td>202</td><td>41</td><td>Independent claims in excess of 3</td></tr><tr><td>104</td><td>270</td><td>204</td><td>135</td><td>Multiple Dependent claim</td></tr><tr><td>109</td><td>82</td><td>209</td><td>41</td><td>**Reissue independent claims over original patent</td></tr><tr><td>110</td><td>22</td><td>210</td><td>11</td><td>**Reissue claims in excess of 20 and over original patent</td></tr><tr><td colspan="5">SUBTOTAL (2) (\$)</td><td>132.00</td></tr></tbody></table>		Large Fee Code	Entity Fee (\$)	Small Fee Code	Entity Fee (\$)	Fee Description	Fee Paid	101	790	201	395	Utility filing fee	\$790	106	330	206	165	Design filing fee		107	540	207	270	Plant filing fee		108	790	208	395	Reissue filing fee		114	150	214	75	Provisional filing fee		SUBTOTAL (1) (\$)					790.00	Total Claims	Extra Claims	Fee from below	Fee Paid	26	-20** = 6	X \$22.00 =	132.00	3	-3** = 0	X \$82.00 =	0.00	Multiple Dependent				Large Fee Code	Entity Fee (\$)	Small Fee Code	Entity Fee (\$)	Fee Description	103	22	203	11	Claims in excess of 20	102	82	202	41	Independent claims in excess of 3	104	270	204	135	Multiple Dependent claim	109	82	209	41	**Reissue independent claims over original patent	110	22	210	11	**Reissue claims in excess of 20 and over original patent	SUBTOTAL (2) (\$)					132.00																																																																																								
Large Fee Code	Entity Fee (\$)	Small Fee Code	Entity Fee (\$)	Fee Description	Fee Paid																																																																																																																																																																																		
101	790	201	395	Utility filing fee	\$790																																																																																																																																																																																		
106	330	206	165	Design filing fee																																																																																																																																																																																			
107	540	207	270	Plant filing fee																																																																																																																																																																																			
108	790	208	395	Reissue filing fee																																																																																																																																																																																			
114	150	214	75	Provisional filing fee																																																																																																																																																																																			
SUBTOTAL (1) (\$)					790.00																																																																																																																																																																																		
Total Claims	Extra Claims	Fee from below	Fee Paid																																																																																																																																																																																				
26	-20** = 6	X \$22.00 =	132.00																																																																																																																																																																																				
3	-3** = 0	X \$82.00 =	0.00																																																																																																																																																																																				
Multiple Dependent																																																																																																																																																																																							
Large Fee Code	Entity Fee (\$)	Small Fee Code	Entity Fee (\$)	Fee Description																																																																																																																																																																																			
103	22	203	11	Claims in excess of 20																																																																																																																																																																																			
102	82	202	41	Independent claims in excess of 3																																																																																																																																																																																			
104	270	204	135	Multiple Dependent claim																																																																																																																																																																																			
109	82	209	41	**Reissue independent claims over original patent																																																																																																																																																																																			
110	22	210	11	**Reissue claims in excess of 20 and over original patent																																																																																																																																																																																			
SUBTOTAL (2) (\$)					132.00																																																																																																																																																																																		

SUBMITTED BY		Complete (if applicable)	
Typed or Printed Name	Vincent P. Tassinari, Reg. No. 42,179	Reg. Number	
Signature		Date	9/30/98
		Deposit Account User ID	02-2666

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231.

Our File No: 042390.P5980
Express Mail No: EM522830405US

UNITED STATES PATENT APPLICATION

FOR

DIGITAL COAXIAL CABLE LAN

Inventor(s):

Amir S. Afshary
Desikan Iyadurai
Brian R. Mears
Gregory B. Tucker

Prepared By:

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN
12400 Wilshire Blvd., 7th Floor
Los Angeles, California 90025-1026
(310) 207-3800

042390.P5980

BACKGROUND OF THE INVENTION

Field of the Invention

The invention relates generally to networking and more particularly to data distribution through a coaxial cable at frequencies that take advantage of the operating frequency spectrum of the coaxial cable so as to not interfere with the operating frequency of the client data within the coaxial cable.

Background Information

Conventional homes contain many electronic devices that generate data or operate on data received internally, from other devices, or from sources outside of the home. For example, content devices such as televisions, video cassette recorders, personal computers, and stereos as well as monitor and control devices such as climate-control devices, security devices, and home automation devices all generate or use data. In-home local area networks (LANs) may be used to distribute such data around the home, both to and from these devices.

As home based LANs become more popular for in-home networking, the ability to transmit high-bandwidth data including digital video remains difficult to implement. Several alternative mediums for in-home networking are known. For example, current solutions that do not require new wiring include AC power lines, telephone lines, and wireless communication. There are also options that require installing new wires such as CAT-5 twisted pair, fiber optic, and IEEE 1394 (fire-wire). In general, the solutions that do not require new wires suffer from low bandwidth or high cost. Solutions that require new wires suffer from being expensive as well as technology that has not been proven over time as compared to coaxial cables. Table I lists some of these alternative mediums with their limitations.

MEDIUM	LIMITATIONS
AC power-lines	Unregulated Low bit-rate (Harsh environment) Data security issues Perceived usage hazards
Telephone lines	RF interference RF emissions regulations
Wireless	Limited bandwidth Expensive Data security issues Transmission disruption due to movement
New wires	Installation costs Maintenance costs

Table 1: Alternative Mediums

Thus, there is a need to transmit data around the home and elsewhere in cost-effective, quick, and secure fashion.

SUMMARY OF THE INVENTION

The invention relates to a coaxial cable local area network (LAN) for digitally communicating client generated data between clients of the cable LAN. The cable LAN has adapters in communication with both the clients and other adapters of the cable LAN. Connected through coaxial cable, these adapters generate and communicate data transmitting signals that take advantage of the operating frequency spectrum of the coaxial cable so as to not interfere with the operating frequency of the client data within the coaxial cable. Other features are disclosed.

36060" / 2449760

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an illustration of an in-home coaxial cable LAN in accordance with an embodiment of the invention.

FIG. 2 is a schematic illustration of a coaxial cable LAN in accordance with an
5 embodiment of the invention.

FIG. 3 illustrates an operating frequency of the client data and the adapter signal in accordance with an embodiment of the invention..

FIG. 4 is a schematic of an architecture of a cable LAN adapter in accordance with an embodiment of the invention.

042390.P5980 20040503

DETAILED DESCRIPTION OF THE INVENTION

The invention discloses a coaxial cable local area network (LAN) for communicating data between clients of the cable LAN. The benefits of the cable LAN is the ability transmit data in cost-effective, secure fashion, without interfering with cable service company operations.

For purposes of explanation, specific embodiments are set forth to provide a thorough understanding of the present invention. However, it will be understood by one skilled in the art, from reading this disclosure, that the invention may be practiced without these details. Moreover, well-known elements, devices, process steps and the like are not set forth in detail in order to avoid obscuring the present invention.

Reference is now made to **Figures 1** through **4** to illustrate the embodiments of the invention. **Figure 1** is an illustration of an in-home coaxial cable LAN. As shown, drop cable **10** enters home **12** after it is tapped off main trunk **14** through cable service company splitter **15** within distribution box **16**. Near the point at which drop cable **10** enters home **12**, low pass filter (LPF) **18** is installed by the user, upstream of the in-home cable LAN network and downstream of any cable service company supplied low pass filter **20**.

A cable LAN isolator such as LPF **18** preferably is installed by the user downstream of cable service company splitter **15**, even when a low pass filter is provided by the cable service company as shown by low pass filter **20** in **Figure 1**. The need for such a device can be attributed to several operational limitations such as security, performance improvement of premise network, and legal compliance. Here, LPF **18** maintains security for the cable LAN, works to improve the

performance of the cable LAN, and prevents signals generated within the cable LAN from interfering with cable service company operations.

By restricting spurious signals or cable LAN signals to the premise of the user, LPF 18 maintains security by preventing such signals from getting back to the public cable network. Although LPF 18 is shown installed within the physical premise of home 12, LPF 18 may be secured elsewhere to maintain security. For example, installing LPF 18 within a lock box external to home 12 would maintain security. LPF 18 will also reflect cable LAN transmitted signals back into the network of the cable LAN. Thus, where splitter 22 is located close to LPF 18, the return loss characteristics of LPF 18 may be helpful in coupling the cable LAN signal power from one arm of splitter 22 to another arm of splitter 22. This, in turn, would decrease the amount of power needed to transmit cable LAN signals and thus improve the performance of the invention. Moreover, by preventing signals generated within the cable LAN from interfering with cable service company signals within main trunk 14, LPF 18 serves legal compliance requirements.

Depending on the type of cable system, LPF 18 will have different cut-off frequencies. For example, one cable system only requires that the low pass filter have a cut off frequency of less than 1000 MHz whereas older cable systems require that the low pass filter have a cut off frequency of less than 450 MHz.

Coaxial cable splitters permit more than one client to receive identical data by dividing the cable into two or more cable wires. Thus, from the point at which drop cable 10 enters home 12, drop cable 10 is split by splitter 22 into different cable wires 24, each cable wire 24 being routed to different rooms in home 12. Within living room 26 of Figure 1 is living room television (TV) 28 having set top box (STB) 30. Set top box 30 includes boxes that provide interactive television through high speed

internet data access. Coupled between cable wire 24 and set top box 30 is cable LAN adapter 32. Cable wire 24 is also routed to office 32. Within office 32 is office personal computer (PC) 36 having an internet gateway. The internet gateway may be personal computer 36 having high speed access to the internet, where the high speed access may be achieved through the shown a cable modem 30, as well as other connection such as asymmetric digital subscriber loop (ADSL) modem, an integrated service digital network (ISDN), a T1 line, and a multimedia cable network system (MCNS) cable modem. Coupled between cable wire 24 and personal computer 36 is a second cable LAN adapter 32.

Cable wire 24 is also routed to bedroom 40 and to bedroom 46. To communicate with cable LAN adapter 32 in bedroom 40 and bedroom 46, cable wire 24 is further divided from splitter 22 by splitter 38 into two cable wires 24. Within bedroom 40 is bedroom TV 42 having set top box 44. Coupled between cable wire 24 and set top box 44 is a third cable LAN adapter 32. Within bedroom 46 is bedroom PC 48 coupled to a fourth cable LAN adapter 32. To complete the cable LAN network, cable wire 24 from splitter 38 is connected to cable LAN adapter 32 in bedroom 46. The number and arrangement of rooms and clients in home 12 is not particular to an embodiment of the invention. Home 12 may have different rooms, in different numbers and arrangements, each having different clients.

Typical clients of the cable LAN network are shown in **Figure 2**. These clients may include digital TV set top box 50, digital video cassette recorder (VCR) 52, digital TV 54, home control and monitoring hub 56, wireless hub 58 with bridge 60, personal computer 62, and personal computer motherboard 64. Bridge 60 of wireless hub 58 is capable of communicating with different wireless devices. For example, one such wireless device may be a remote-control device that can be used for multiple clients on the network such as PC's, set top boxes, and digital TV's.

As shown in **Figure 2**, client interface 66 couples cable LAN adapter 32 to a client. Adapter 32 serves to connect these clients to the network of cable wires 24. Client interface 66 may be any suitable computer interface, such as a Peripheral Component Interconnect (PCI) adapter card, Universal Serial Bus (USB), or buses meeting the Institute of Electronic and Electrical Engineering standard for a high performance serial bus, IEEE 1394. Adapter 32 may also be coupled to a client by other techniques. For example, adapter 32 may be housed in a client of the cable-LAN network such as indicated by dashed lines 68 for PC motherboard 64.

In the preferred embodiment, there is at least one cable wire 24 couple between a pair of adapters 32. In tests run on signal attenuation due to cable length, coaxial cable wire 24 that totaled less than 1000 feet in length operated within acceptable attenuation loss limits. Longer lengths are possible and are a function of at least the hardware and software of adapter 32.

The overall operation can be understood from **Figure 2**. In the overall operation, a first client, such as PC 62, communicates digital data to a first cable LAN adapter 32 through client interface 66. After processing the data for transmission, the first cable LAN adapter 32 communicates the processed data to a second cable LAN adapter 32 through coaxial cable wire 24. On receiving the data, the second adapter 32 further processes the transmitted data to a form usable by a second client, such as digital TV 54, and transmits that data to second client digital TV 54 through client interface 66. First cable LAN adapter 32 may also communicate this same data to other adapters 32, that, in turn, may transmit the received data to their associated client.

Figure 3 illustrates an operating frequency of the client data and the adapter signal. Coaxial cables are currently being used by data suppliers to communicated

data such as television and internet data to individual homes. These cables themselves are a very clear, clean medium capable of handling operating frequencies of up to 2000 MHz. However, most of this operating frequency spectrum goes unused by data suppliers since initially there was little need for frequencies higher than 450 MHz and, as need for higher operating frequencies slowly increased, costs to changing the infrastructure of the data suppliers became the prohibiting factor.

The lower region identified in Figure 3 as 0-950 MHz is where conventional cable TV, digital cable TV, and cable modem services are offered. Where this is the case, the cable LAN signal operating frequency may be located within the higher region identified as 1000 - 2000 MHz at the center frequency of 1300 MHz with a bandwidth of 5 MHz. Here, the cable LAN utilizes the operating frequency spectrum not used by conventional cable services. The same is true for other forms of data such climate-control data, security data, home automation data, Moving Picture Experts Group 2 (MPEG-2) high resolution digital video data, audio data, or internet data.

In the preferred embodiment, a signal generated by adapter 32 downstream of LPF 18 rapidly transmits data from one adapter to another adapter as a carrier modulated digital signal. The carrier modulated digital signal may be generated in conjunction with using Quadrature Phase Shift Keying (QPSK) modulation typically employed on satellite technology. Since QPSK modulation operates at 2 bits per hertz, the signal speed would be 10 megabits per second (Mbps) for a 5 MHz bandwidth. Modulation is further discussed below.

A significant advantage of this invention is the large bandwidths that may be applied in transmitting data. For example, within the 1000 - 2000 MHz region

shown in **Figure 3**, bandwidths of 5 MHz, 10 MHz, 20 MHz, 50 MHz, or higher are possible. By using bandwidths larger than 5 MHz, the signal speed increases. With coaxial cabling, speeds greater than 100 Mbps can be achieved. Preferably, the signal speed will be greater than 10 Mbps when necessary to quickly distribute digital video and other types of high-bandwidth data within the home.

As depicted in **Figure 3**, the signal operating frequency could be anywhere above 1000 MHz. However, Cable LAN's operating region is not limited to this. For example, in older homes that use older type coaxial cable and older type splitters, normal cable operations are maintained below 450 MHz. In this case, the signal operating frequency of the cable LAN would preferably be between 600 to 800 MHz, but need not be. Since the signal operating frequency is subject at the lower end to the client data operating frequency, the signal operating frequency could be just at the border or fringe of the rated or actual data operating frequency being utilized within the coaxial cable. Operating at the border or fringe of the data operating frequency takes advantage of the operating frequency spectrum of the coaxial cable so as to not interfere with the operating frequency of the data, thereby permitting the signal and data other than that carried by the signal to be communicated within the coaxial cable at the same time, within the same space. Being adaptable enough to operate at this periphery of the data operating frequency makes the cable LAN flexible enough to operate on any coaxial cable system, despite the different limitations such as older network components, different geographies, different service providers, and different regulations. Moreover, since the signal operating frequency is subject at the higher end only to the operating frequency spectrum of the coaxial cable, the signal bandwidth may be much greater than 5 MHz, thereby increasing the signal speed. A 100 MHz bandwidth, for example, results in a signal speed of 200 Mbps. In this way, the large operating bandwidth makes the cable LAN

ideal for quickly transmitting high-resolution digital video (such as MPEG-2) and other high speed data.

Figure 4 is a schematic of an architecture of cable LAN adapter **32**. As seen in **Figure 4**, client software layers **70** is comprised of cable LAN protocol layers/stacks **72** and interface software/driver stack **74**. Analog or digital data from a first client is processed as necessary through that client's software layer into a digital format. This digitized data is then communicated to cable LAN adapter **32** associated with that first client for processing through the hardware sections of the cable LAN adapter. In accordance with an embodiment of the cable LAN adapter of the invention, cable LAN adapter **32** partitions into four hardware sections: I. MAC & Client Interface Section **80**; II. Baseband Section **90**; III. RF & Mixed Signal Section **100**; and IV. Medium Interface Section **130**.

I. MAC & Client Interface Section

As part of broadband application specific integrated circuit (ASIC) **78**, Media Access Control (MAC) & Client Interface section **80** operates both as a burst controller and as a protocol device to coordinate events -- such as when to receive the data from the client and when to transmit data to the client -- between the client and Baseband section **90** of cable LAN adapter **32**.

Client interface **76** is the front line communication link between adapter **32** and the particular client. Preferably, the client interface logic communicates with the client, communicates with the modulator, processes the particular data from the client and the modulator, and keeps track of time. Given the variety of clients that may occupy the cable LAN, it is important to utilize a universal client interface.

As shown in **Figure 4**, the hardware of client interface 76 may be a stand alone component coupled by coaxial cable between interface (I/F) core 82 of broadband ASIC 78 and the in/out (I/O) port of the client. Such stand alone components include a Universal Serial Bus (USB) attachment or attachments meeting the
5 Institute of Electronic and Electrical Engineering (IEEE) standard for a high performance serial bus, IEEE 1394. Client interface 76 may also be integrated into MAC & Client Interface section 80 of cable LAN adapter 32 or housed into the motherboard of a client such as a personal computer (PC) or a set top box (STB). Moreover, through an expansion card such as a Peripheral Component Interconnect
10 (PCI) adapter card, client interface 76 may be housed internally to adapter 32 or to a client.

If data copyright protection is a concern, client interface 76 can be coupled to a dongle security system key consisting of a serialized erasable programmable read-only memory (EPROM) and some drivers in a D-25 connector shell connected to the
15 I/O port of either adapter 32 or the client. With a dongle security system key installed, users can make as many communications or "copies" of the data as they want but must respond with the dongle's programmed validation code for each copy, thereby accounting for each copy made. To allow daisy-chained dongles, the dongles can be designed to pass data through the I/O port and to monitor for magic
20 codes (and combinations of status lines) with little interference to devices further down the line.

Burst controller 84 of MAC & Client Interface section 80 is a time division multiple access (TDMA) scheme that supports both isochronous and asynchronous data through burst control as well as accounts for high interrupt latency on the PC.
25 Isochronous service guarantees the reserved bandwidth while asynchronous service

provides a conventional LAN type of service that is ideal for data sharing applications.

II. Baseband Section

From MAC & Client Interface section 80, the digital data is communicated to Baseband section 90 that is part of broadband ASIC 78. In Baseband section 90, the data is encoded and modulated.

To encode the data, Forward Error Correction (FEC) encoder 92 is used. Preferably, FEC encoder 92 is a Reed-Solomon Error Correction Code (R-S ECC) encoder. The advantage of using a RS ECC encoder is that the RS ECC encoder may be reused in the FEC decoder 94, thereby dramatically reducing the complexity of syndrome calculation and thus reducing processing speed burden on the syndrome block. On interacting with FEC encoder 92, parity bits (or bytes) are added to the data to permit detection of data that becomes corrupted in transit as well as permit correction of the same. Other bits that may be added include network control data that specifies the routing, content data that specifies the what is being transmitted, as well as other known parity bits.

Once through FEC encoder 92, the data encounters modulator 96. Modulator 96 remaps the digital data and presents the data in an analog wave form to permit the data to be transmitted within the coaxial cable. It is important for cable LAN adapter 32 to be screened from noise and hardy enough to work in any environment while remaining inexpensive. Thus, in order to keep costs low and the system robust, the architecture design of adapter 32 uses a digital modulation scheme such as Frequency Shift Keying (FSK) modulation or Binary Phase Shift Keying (BPSK) modulation. Moreover, although data may be transmitted within the coaxial cable continuously, discontinuously, or a combination thereof, modulation is done

preferably in a discontinuous, burst fashion to accommodate network type data with minimum receiver setup time. Other acceptable modulation schemes include Quadrature Phase Shift Keying (QPSK) digital modulation.

III. RF & Mixed Signal Section

From Baseband section 90, the data encounters Radio Frequency (RF) and Mixed Signal section 100. The RF & Mixed Signal section consists of a complementary metal-oxide semiconductor (CMOS) RF chip 102, crystal oscillator 104, and crystal oscillator 106. Crystal oscillator 104 and crystal oscillator 106 generate the clock that runs CMOS RF chip 102. As shown in Figure 4, CMOS RF chip 102 comprises mixed-signal section having digital to analog converter (DAC) 108 and analog to digital converter (ADC) 110, up converter 112 and down converter 114, power amplifier (PA) 116 and a low noise amplifier (LNA) 118, and Low (LO) frequency synthesizer (SYN) timing circuit 120 that couples the converters to their respective amplifiers through mixer 122.

Within DAC 108, the digital data from modulator 96 is converted to an analog signal having an intermediate frequency (IF) of around 44 MHz. To bring the signal operating frequency to the desired transmitting frequency, here 1300 MHz as seen in Figure 3, the analog signal is processed by up converter 112. Up converter 112 generates a carrier modulated digital signal on which to transmit client data through the coaxial cable network. The power is amplified in PA 116, wherein the signal is then sent to Medium Interface section 130.

IV. Medium Interface Section

In accordance with an embodiment of the invention, Medium Interface section 130 interfaces with cable wire 24 through switch 132 that operates to either

transmit or receive signals. A single pole double throw (SPDT) transmission switch would accomplish this. Through switch 132, the signal is transmitted into cable wire 24. Although Figure 4 shows a one signal frequency design channel, more than one signal frequency may be used.

5 With the signal transmitted from a first adapter 32, at least a designated second adapter 32 will receive the signal. On receiving the transmitted data through cable wire 24, second adapter 32 reverses the process by converting the transmitted data into a form usable by a second client and transmitting that data to that client. From switch 132 of Figure 4, LNA 118 focuses the signal so that down converter 114
10 may convert the signal to an intermediate frequency (IF) of around 44 MHz. The analog signal is then converted to a digital signal in ADC 110.

At this point in the process, filtering may be necessary. As the signal travels within the coaxial cable network, reflection from low pass filter 18 may compensate for signal attenuation due to splitters in the coaxial cable network, but may also
15 cause a reflection mismatch between the signal and the reflected signal. Filters within Baseband section 90 filter out such reflected signals. From there, the signal is demodulated at demodulator 94 with the data then being decoded and corrected at FEC decoder 94. The digital data is then sent to the second client through MAC & Client Interface section 80.

20 A specific embodiment of the cable LAN according to the invention has been described for the purpose of illustrating the manner in which the invention may be made and used. It should be understood that implementation of other variations and modifications of the invention and its various aspects will be apparent to those skilled in the art, who may develop a variation of structural details without
25 departing from the principles of the present invention. For example, the

components of the cable LAN adapter, either individually or in combination, can be housed in an integrated circuit. The cable LAN has been describe in reference to use in a private home, but may be used for any enterprise that has cabling equal to or superior than that found in a typical private home, including a small office/home office (SOHO).

5.

060600" 2413160

CLAIMS

What is claimed is:

1 1. A digital coaxial cable LAN for communicating data between clients of the
2 cable LAN, the cable LAN comprising:

3 a plurality of clients;

4 a plurality of adapters, one adapter in communication with at least one client
5 and in communication with at least one other adapter;

6 at least one coaxial cable couple between a pair of adapters, the at least one coaxial
7 cable having an operating frequency spectrum, the operating frequency
8 spectrum having at least a first portion and a second portion;

9 data having a data operating frequency that occupies the first portion of the
10 operating frequency spectrum of the coaxial cable; and

11 at least one signal having a signal operating frequency that occupies the second
12 portion of the operating frequency spectrum of the coaxial cable, the at least
13 one signal controlled by at least one of the plurality of adapters and adapted to
14 transport the data from one adapter to the at least one other adapter.

1 2. The cable LAN of claim 1 wherein at least one of the plurality of adapters is
2 integrated into a client of the cable LAN.

1 3. The cable LAN of claim 1 wherein the at least one signal is an in-home signal
2 and the coaxial cable is tapped off of a public cable network.

1 4. The cable LAN of claim 3 further comprising a low pass filter coupled
2 upstream of the in-home signal.

1 5. The cable LAN of claim 4, the low pass filter having a cut off frequency less
2 than 1000 MHz.

1 6. The cable LAN of claim 1 wherein the at least one signal is a carrier
2 modulated digital signal.

1 7. The cable LAN of claim 6 wherein the at least one signal is an in-home signal,
2 the cable LAN further comprising a low pass filter coupled upstream of the in-home
3 signal to a public cable network, wherein the carrier modulated digital signal is
4 generated downstream of the low pass filter.

1 8. The cable LAN of claim 7 wherein the signal operating frequency is just at the
2 fringe of the data operating frequency.

1 9. The cable LAN of claim 8 wherein the signal operating frequency is greater
2 than approximately 1000 MHz.

1 10. The cable LAN of claim 9 wherein the signal operating frequency is between
2 1000 MHz and 2000 MHz.

1 11. The cable LAN of claim 10 wherein the signal operating frequency is
2 approximately 1300 MHz.

1 12. The cable LAN of claim 9 wherein the signal operating frequency has a
2 bandwidth of at least 5 MHz.

1 13. In a housing, a cable LAN adapter for communicating with external data and
2 external signals carrying data, the adapter comprising:

3 a broadband ASIC having an I/F core adapted to communicate with the external
4 data, a burst controller in communication with the I/F core, and a baseband

5 section having an encoder, a decoder, a modulator and a demodulator,
6 wherein the burst controller is in communication with the baseband section;
7 means for communicating with the baseband section of the broadband ASIC, the
8 means for communicating adapted to convert data to signal and signal to
9 data, means for communicating having a mixed signaler coupled to an up-
10 down converter and having an amplifier coupled to the up-down converter
11 through a synthesizer; and
12 a medium interface switch coupled to the means for communicating and
13 adapted to communicate with the external signals.

1 14. The adapter of claim 13 wherein the means for communicating with the
2 baseband section of the broadband ASIC is a radio frequency device in
3 communication with the baseband section of the broadband ASIC.

1 15. The adapter of claim 14 wherein the I/F core is adapted to communicate with
2 external data through a client interface.

1 16. The adapter of claim 15 wherein the client interface is an expansion card.

1 17. The adapter of claim 15 wherein the client interface is one of a Universal
2 Serial Bus (USB) attachment and an attachment meeting the IEEE 1394 standard.

1 18. The adapter of claim 15 further comprising a dongle security system key
2 coupled to the client interface.

1 19. The adapter of claim 14 wherein the encoder is a forward error correction
2 encoder.

1 20. The adapter of claim 19 wherein the forward error correction encoder is a
2 Reed-Solomon Error Correction Coding (RS ECC) encoder adapted to operate as the
3 encoder and the decoder.

1 21. The adapter of claim 14 wherein the modulator is adapted to modulate in a
2 discontinuous, burst fashion.

1 22. The adapter of claim 14 wherein the mixed signaler is comprised of a DAC
2 and ADC, the synthesizer is a low frequency synthesizer, the amplifier is comprised
3 of a power amplifier and a low noise amplifier, the up-down converter is comprised
4 of an up converter and a down converter, wherein the low frequency synthesizer
5 couples the up converter to the power amplifier through a first mixer and couples
6 the down converter to the low noise amplifier through a second mixer.

1 23. The adapter of claim 22 wherein the DAC is adapted to converted digital data
2 to an analog signal having an intermediate frequency and wherein the up converter
3 is adapted to convert the intermediate frequency to a frequency that can be
4 transmitted through a coaxial cable without interfering with data or other signals
5 within the coaxial cable.

1 24. The adapter of claim 14 wherein the medium interface switch is adapted to
2 interface with coaxial cable.

1 25. A method for communicating data between a first adapter coupled to a second
2 adapter by a coaxial cable, the method comprising the steps of:
3 receiving digitized data in the first adapter from a client, the digitized data
4 having a data operating frequency;
5 processing the digitized data within the first adapter into a signal having a signal
6 operating frequency that is greater than the data operating frequency; and

ABSTRACT OF THE DISCLOSURE

The invention relates to a coaxial cable local area network (LAN) for digitally communicating client generated data between clients of the cable LAN. The cable LAN has adapters in communication with both the clients and other adapters of the cable LAN. Connected through coaxial cable, these adapters generate and communicate data transmitting signals that take advantage of the operating frequency spectrum of the coaxial cable so as to not interfere with the operating frequency of the client data within the coaxial cable. Other features are disclosed.

360650 " 2-24-37-60

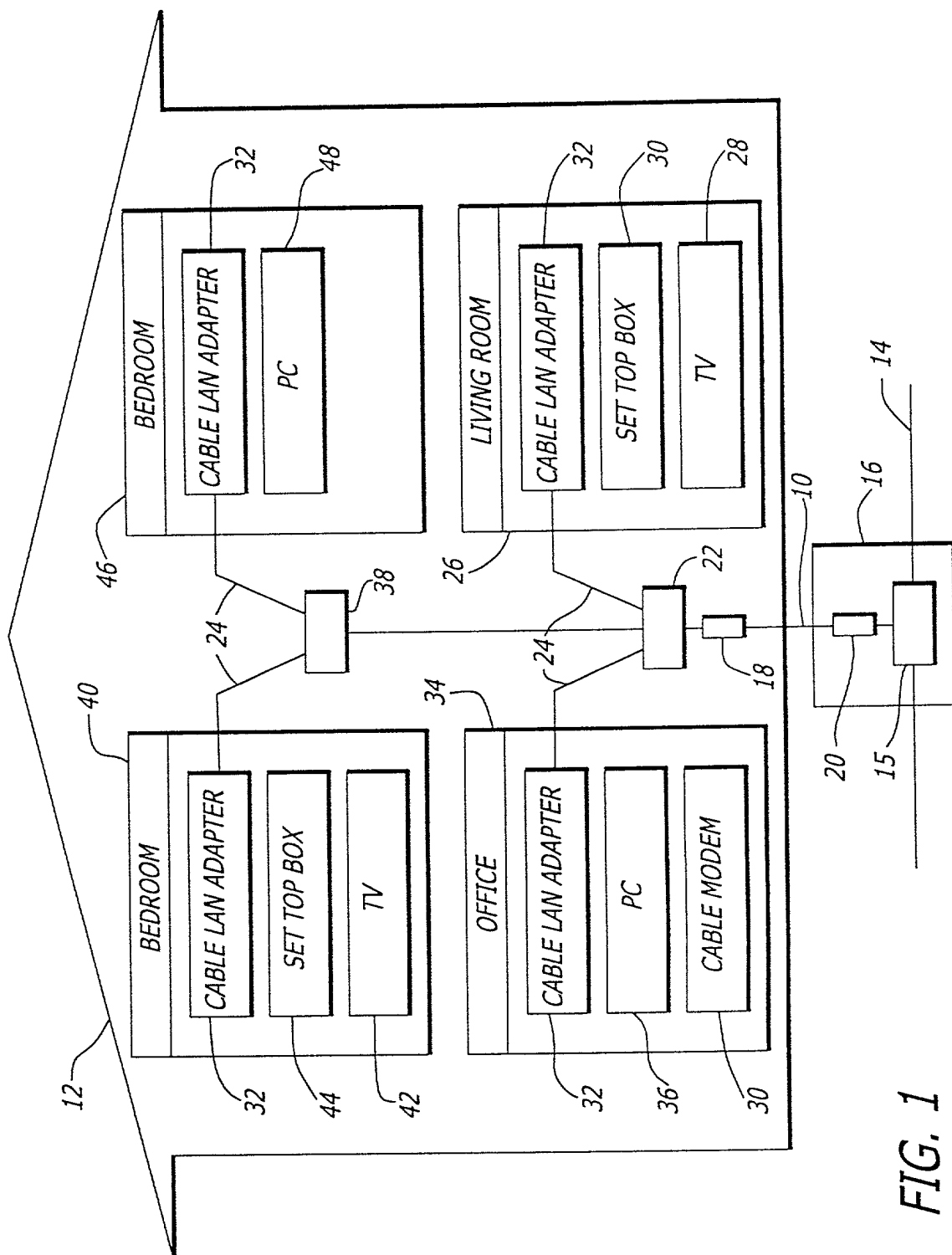


FIG. 1

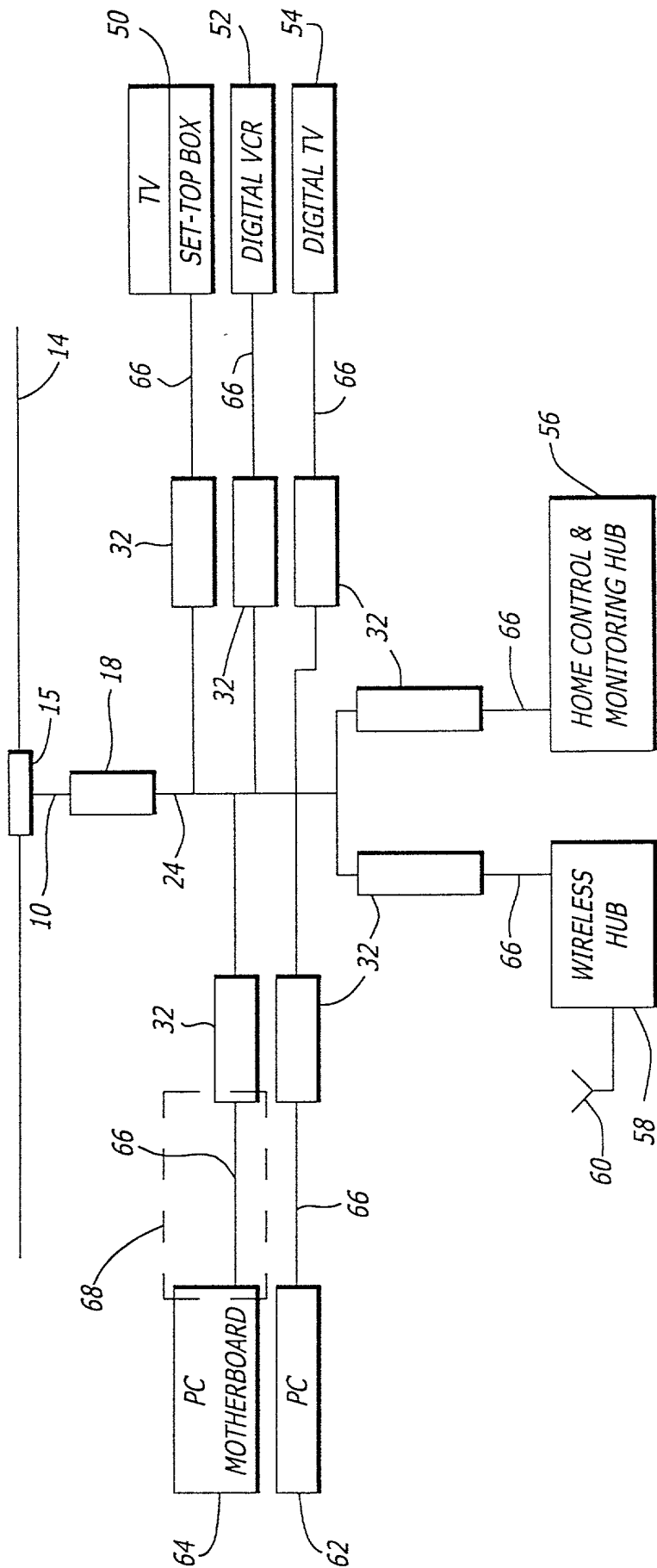


FIG. 2

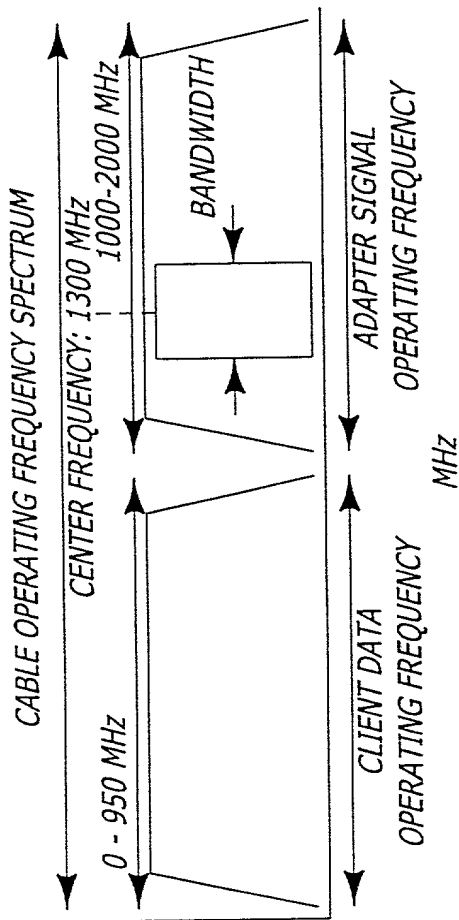


FIG. 3

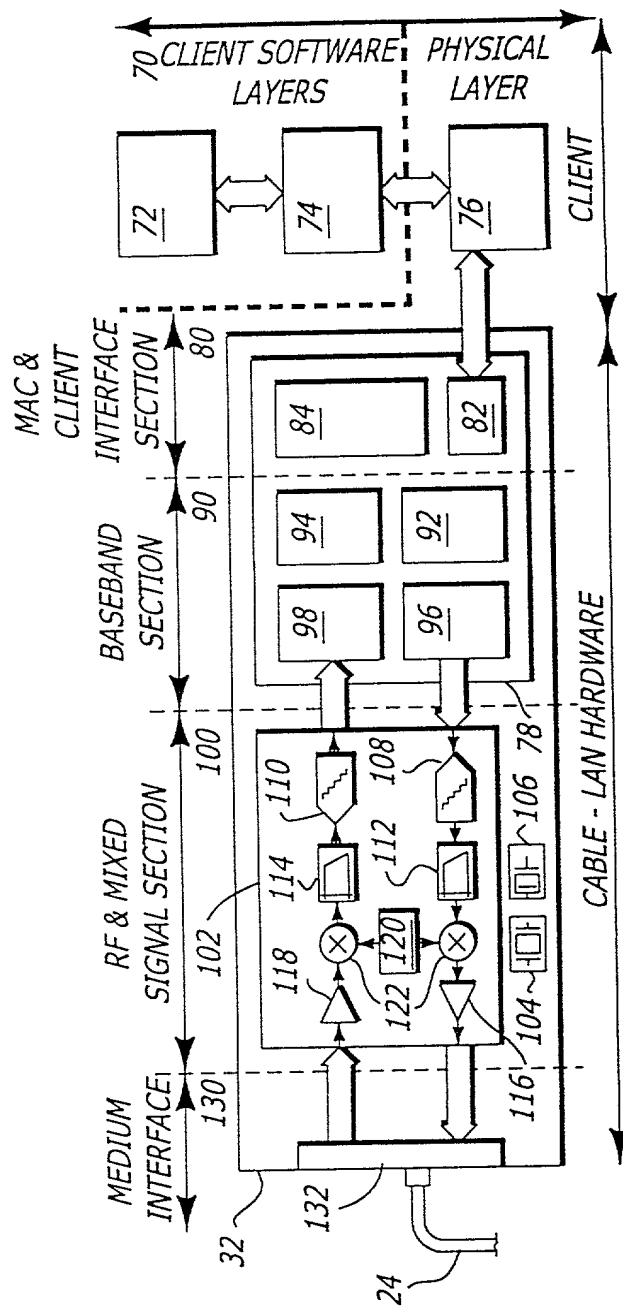


FIG. 4

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below, next to my name.

I believe I am the original, first, and sole inventor (if only one name is listed below) or any original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

DIGITAL COAXIAL CABLE LAN

the specification of which ☒ is attached hereto.

☐

was filed on _____ as

United States Application Number _____

or PCT International Application Number _____

and was amended on _____

(if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment referred to above. I do not know and do not believe that the claimed invention was ever known or used in the United States of America before my invention thereof, or patented or described in any printed publication in any country before my invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, and that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months (for a utility patent application) or six months (for a design patent application) prior to this application.

I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d), of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s):

APPLICATION NUMBER	COUNTRY (OR INDICATE IF PCT)	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 37 USC 119
			<input type="checkbox"/> No <input type="checkbox"/> Yes
			<input type="checkbox"/> No <input type="checkbox"/> Yes
			<input type="checkbox"/> No <input type="checkbox"/> Yes

I hereby claim the benefit under Title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below:

APPLICATION NUMBER	FILING DATE

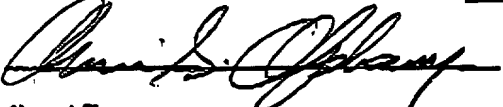
I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

APPLICATION NUMBER	FILING DATE	STATUS (ISSUED, PENDING, ABANDONED)

I hereby appoint BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN, a firm including: Farzad E. Amini, Reg. No. P42,261; Aloysius T. C. AuYeung, Reg. No. 35,432; William Thomas Babbitt, Reg. No. 39,591; Carol F. Barry, P41,600; Jordan Michael Becker, Reg. No. 39,602; Bradley J. Bereznak, Reg. No. 33,474; Michael A. Bernadicou, Reg. No. 35,934; Roger W. Blakely, Jr., Reg. No. 25,831; Gregory D. Caldwell, Reg. No. 39,926; Kent M. Chen, Reg. No. 39,630; Lawrence M. Cho, Reg. No. 39,942; Yong S. Choi, Reg. No. P43,324; Thomas M. Coester, Reg. No. 39,637; Roland B. Cortes, Reg. No. 39,152; Barbara Bokanov Courtney, Reg. No. P42,442; William Donald Davis, Reg. No. 38,428; Michael Anthony DeSanctis, Reg. No. 39,957; Daniel M. De Vos, Reg. No. 37,813; Tarek N. Fahmi, Reg. No. P41,402; James Y. Go, Reg. No. 40,621; Richard Leon Gregory, Jr., P42,607; Dinu Gruia, Reg. No. P42,996; David R. Halvorson, Reg. No. 33,395; Thomas A. Hassing, Reg. No. 36,159; Phuong-Quan Hoang, P41,839; Willmore F. Holbrow III, Reg. No. P41,845; George W. Hoover II, Reg. No. 32,992; Eric S. Hyman, Reg. No. 30,139; Dag H. Johansen, Reg. No. 36,172; William W. Kidd, Reg. No. 31,772; Tim L. Kitchen, Reg. No. P41,900; Michael J. Mallie, Reg. No. 36,591; Paul A. Mendonsa P42,879; Darren J. Milliken, P42,004; Thinh V. Nguyen, Reg. No. P42,034; Kimberley G. Nobles, Reg. No. 38,255; Michael A. Proksch P43,021; Babak Redjaian, Reg. No. P42,096; James H. Salter, Reg. No. 35,668; William W. Schaal, Reg. No. 39,018; James C. Scheller, Reg. No. 31,195; Anand Sethuraman, Reg. No. P43,351; Charles E. Shemwell, Reg. No. 40,171; Maria McCormack Sobrino, Reg. No. 31,639; Stanley W. Sokoloff, Reg. No. 25,128; Allan T. Sponseller, Reg. No. 38,318; Steven R. Sponseller, Reg. No. 39,384; Geoffrey T. Staniford, P43,151; Judith A. Szepesi, Reg. No. 39,393; Vincent P. Tassinari, Reg. No. P42,179; Edwin H. Taylor, Reg. No. 25,129; George G. C. Tseng, Reg. No. 41,355; Lester J. Vincent, Reg. No. 31,460; John Patrick Ward, Reg. No. 40,216; Stephen Warhola, P43,237; Ben J. Yorks, Reg. No. 33,609; and Norman Zafman, Reg. No. 26,250; my attorneys; and Amy M. Armstrong, Reg. No. P42,265; Robert Andrew Diehl, Reg. No. P40,992; and Edwin A. Sloane, Reg. No. 34,728; my patent agents, with offices located at 12400

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of Sole/First Inventor (given name, family name) Amir S. Afshary

Inventor's Signature  Date 9/30/98

Residence Chandler, AZ (City, State) Citizenship U.S. Citizen (Country)

P. O. Address 5333 W. Dublin Ct.

Chandler, AZ 85226 USA

2 YADURAI

Full Name of Second/Joint Inventor (given name, family name)

Desikan Iyadurai

Inventor's Signature

Date

09/30/98

Residence

Phoenix, AZ

(City, State)

Citizenship

India

(Country)

P. O. Address 11221 S. 51st. Street #2047

Phoenix, AZ 85044 USA

Full Name of Third/Joint Inventor (given name, family name)

Brian R. Meeks

Inventor's Signature

Date

9/30/98

Residence

Tempe, AZ

(City, State)

Citizenship

Britain

(Country)

P. O. Address 401 East

Excitation Lane

Tempe, AZ 85284 USA

Full Name of Fourth/Joint Inventor (given name, family name)

Gregory B. Tucker

Inventor's Signature

Date

9/30/98

Residence

Chandler, AZ

(City, State)

Citizenship

United States

(Country)

P. O. Address 3782 W. Park Avenue

Chandler, AZ 85226 USA

Full Name of Fifth/Joint Inventor (given name, family name)

Inventor's Signature

Date

Residence

Citizenship

(City, State)

(Country)

P. O. Address